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DLXIV.—MARRAM GRASS.

(*Ammophila arundinacea*, Host.)

Marram grass is a native of the shores of Europe and North Africa. It is the most important grass for binding moving drift sands. It may be propagated either from portions of the roots or from seed, and is the subject on this account of occasional enquiry. It has been successfully introduced into Australia, on the recommendation of the late Sir Ferd. von Mueller, K.C.M.G., and proved most satisfactory. The following detailed account of it, prepared by Mr. J. H. Maiden, F.L.S., Director of the Botanic Gardens at Sydney, New South Wales, is taken from the *Agricultural Gazette* for New South Wales, vol. vi., pp. 7-12:—

A committee of the Legislature, appointed in 1852 to enquire into the means of preserving Cape Cod Harbour, in Massachusetts, in speaking of the beach between the ocean on the north and the channel of East Harbour, which is all that prevents the sea from breaking over into Cape Cod Harbour, says:—This tract consists of loose sand, driven about by every high wind, which throws it up in heaps like snow-drifts. The wind from any point from north-east to north-west, drives the sand directly from the beach into the channel of East Harbour, and is carried by a strong current into the north-west part of Cape Cod Harbour. The ocean on the north is wasting this narrow beach away in every storm, and the current in East Harbour channel undermining and destroying it on the south. The decay of the beach has been on the increase for several years; it has narrowed within seven or eight years, by the tide that runs through East Harbour channel, from eight to ten rods. Where the mail stage travelled only one year since, is now the channel, with 6 feet of water at low tide, and from 12 to 14 feet at high water."

The first effort made by the State for the preservation of this important harbour appears to have been in 1714. The town was incorporated in 1727, and was at that time a place of some extent;

but the inhabitants soon began to leave, and in less than twenty years it was reduced to two or three families. After the Revolution the place revived, and is now a thriving town.

The object of the law of 1714 was to arrest the destruction of the tree and shrubbery on the province lands, and on the preservation of which it was thought the harbour depended, as they prevented drifting of the sand.

In 1824 commissioners were appointed by the State Government to examine the subject, and report what action was necessary to prevent the rapid destruction of the harbour. They recommended an Act to prevent the destruction of beach-grass, and reported that the sum of 3,600 dollars would be necessary to set out that plant, make fences, etc. The Legislature in 1826 applied to Congress for that sum, and Congress has, at different times, made appropriations to the amount of about 38,000 dollars, which seem to have failed, in some measure, to accomplish the object intended, and East Harbour is still rapidly filling up.

Many years ago, it was as customary to warn the inhabitants of Truro, and some other towns on the Cape every spring, to turn out to plant beach-grass, as it was in the inland towns to turn out and mend the roads. This was required by law, with suitable penalties for its neglect, and took place in April.

A farmer of much practical knowledge concerning this subject, says :—"Since the cattle have been kept from the beaches, by the Act of the Legislature of 1826, the grass and shrubs have sprung up of their own accord, and have, in a great measure, in the westerly parts of the Cape, accomplished what was intended to be done by planting grass. It is of no use to plant grass on the high parts of the beach. Plant on the lowest parts and they will rise, while the highest places, over which the grass will spread, are levelling by the wind. To preserve the beach it must be kept as level as possible."

Beach-grass is of little value, except to prevent our loose sandy beaches from being drifted about by the wind. We have but one species, and this is fast spreading over our upland, making it useless for cultivation. Land that would produce from 20 to 25 bushels of Indian corn to the acre, without any manure, twenty-five or thirty years ago, is now overrun with beach-grass, and will produce nothing else. If the dead grass is burnt off in the spring, it will make a pretty good pasture for cattle and horses. It keeps green longer than any grass we have. It can be cultivated from the seed or by transplanting. Our loose sandy beaches are the most suitable for its growth.

Beach-grass seems to require the assistance of some disturbing causes to enable it to attain its full perfection. The driving winds in some localities are sufficient, while in other places, where it does not thrive so well, it is probable that an iron-tooth harrow would greatly improve and aid its growth. (*Flint, Grasses and Forage Plants.*)

While this grass has been extensively used in Europe, probably for centuries, for binding coast sands, it does not appear to have been introduced into Australia for the purpose until recently.

The seed of the Marram grass was first introduced into the Colony of Victoria by Baron von Mueller in 1883, and by him

entrusted to the Borough Council of Port Fairy for experiment on the barren shifting sand-hummocks fronting the coast line of Port Fairy. It has proved to be the most effectual sandstay ever planted. Practical evidence of its value can be seen in the 50 miles of sandhills extending between Warrnambool and Port Fairy, now reclaimed by the Marram plantations, sown under the direction of Mr. S. Avery, the park ranger. So complete has been the reclamation of the lands, that where a few years ago not a sign of vegetation was to be seen, there now exists a succulent grass eagerly devoured by cattle, and growing to a height of 4 feet. Marram grass is practically indestructible—burning, cutting, or eating off only makes it thrive—while in exposed shifting sand it propagates as surely as in the most sheltered situations.

The grass is planted in rows at a distance of 6 feet apart, the space between the plants at least 2 feet. The depth to which each plant is put into the sand depends upon the nature of the sand. If in sand not likely to drift for two or three months, 9 inches is deep enough; but if very loose and shifting, the grass should be placed from 12 to 15 inches deep. A "plant" consists of as much grass as a man can conveniently hold in his hand, and care is taken to have the roots regular. The system adopted in planting is for one man to dig the hole, and another man puts in the plant, around which he well treads in the sand. After twelve months' growth the plants are fit for thinning out and transplanting.

Cattle are not allowed to graze on the grass until the roots become thoroughly established. It takes 3,630 "plants" to the acre; and there are about 2,800 "plants" to the ton, thus 1 ton 6 cwt. covers one acre. The most favourable time for plants is from 1st May to end of July. The grass retains its vitality, and strikes root after being out of its sand-bed for three months or more. (*Melbourne Leader*, 2nd December, 1893.)

Marram grass commences to flower in November with us. It flowers in July in England.

The following account of the attempts to acclimatise the grass at the Cape are instructive:—

As a specimen plant, *Ammophila* was introduced some years ago into the Botanic Gardens, Cape Town, by Professor MacOwan, and seed obtained from Lincolnshire, England, was sown on the D'Urban Road sands by Mr. Lister. The grass is said to have grown well. It was naturally killed by the Port Jackson wattles sown with it, and it was afterwards abandoned as a temporary stay in favour of the native Pyp grass.

At Eerste River sands, 56 lbs. of seed obtained from Vilmorin & Co., Paris, were sown *in situ* in 1893. The seed germinated only at the foot of the sandhill experimented upon, and from a small patch, not much larger than a good-sized dining-table, 650 bundles of thinnings were taken. These have been transplanted on one-sixth of an acre of sand, in rows 6 feet by 2 feet apart, in accordance with the method described below. Other two-year-old plants will enlarge the Marram Nursery to about half an acre, and one-year-old plants have not been thinned.

The larger plants removed were fully 4 feet high, and thus, with the advantage of Cape Town refuse manure, have attained

in two years, from seed, a growth equal to three-year-old transplants at Port Fairy. That Marram grass is not readily raised from seed appears to be shown in the demand made upon the Victorian plant supplies by other Australian colonies, Africa, and India; but once germinated it seems to thrive amazingly. The actual yearly increase is not stated in the Port Fairy report. From the prolific growth of the limited number of plants at the Eerste River, it is probable that, in favourable situations, and with manure, it will quadruple itself annually.

In a few years thinnings should be available for distribution. To avoid heavy transport charges on large quantities of plants, probably the best plan would be to form a small nucleus plantation of one or two acres at a sheltered spot near the sands to be reclaimed. If such a plantation of 2 acres in one year doubled itself only, in six years sufficient plants would have been produced to reclaim 128 acres of sand. The probability is, however, that the increase would be more rapid.

The first essential measure to success appears to be the fencing in of the sands, to exclude cattle before the grass is mature, and to protect it afterwards in the dry season. The cost per acre of fencing will vary considerably, according to the shape of the sands and their geographical position. On the coast, for instance, with an ocean boundary, one side of the sands would be naturally protected, whereas an inland sand might require fencing on three or more sides.

To arrive at an estimate from which to make local calculations, let us assume a sand-drift to be 1 mile long and half a mile broad—say, 320 acres in extent. Fencing can be erected in most parts of the colony for £50 per mile, or less; say, £150 for the 3-mile boundary, or about 10s. per acre. Holes can be made in the sand, and the plants conveyed from the nucleus plantation and put in for £1 per thousand, say, 3,500 plants per acre, equal £3 10s. Allowing 5s. per acre for direct supervision, an ample charge on extensive works, a total cost of £4 5s. per acre is arrived at, and on 320 acres would cost £1,360 to protect and plant.

If a plough were used for drawing a planting furrow, and closing it again, the cost might be considerably reduced—(*Journal, Department of Agriculture, Cape Town*, 26th July, 1894).

This grass has been extensively planted by the New South Wales Department of Agriculture at the sand-drift at Newcastle, in conjunction with the Maritime Pine (*Pinus maritima*), and the vexed question of how to deal with this drift, which, in times gone by, has been such a source of expense and anxiety, appears to be in a fair way for settlement. The grass is flourishing splendidly, the area under the grass is increasing year by year, and quantities of the grass are each winter season sent away to public bodies and private individuals (in this and other colonies), who desire to resist the encroachments of coast sands. Following is an extract from a letter received from a correspondent supplied by the department, with specimens of the grass for experimental purposes:—

“I beg to report on the success of the experiment to grow Marram grass at Shell Beach, Middle Harbour, where the rootlets

you kindly obtained for me some months back have been growing splendidly, and already throwing out shoots 3 to 4 feet away from the main stems. My friend who planted the roots states that he put in a handful of manure with each root, which, no doubt, assisted the quick growth of the grass, which is now about 2 feet in height, and of a deep green colour.

"Some rootlets that I planted at the same time as the above at Edward's Bay, Middle Harbour, have unfortunately been eaten down by cattle.

"I would strongly advise your department to plant the Marram grass along the Spit Road beach, Middle Harbour, where, if protected during the first year from cattle, it would afford protection to the embankment along the road to the ferry, and also assist in reclaiming an extensive flat on the Pearl Bay side of the Spit."

The department will be glad to supply experimental quantities of the grass to persons willing to plant it in suitable localities. There is no doubt it is far more efficient as a sand stay than the native *Spinifex hirsutus*.

In a report upon the grazing capabilities of the grass furnished to Baron von Mueller, by Mr. Avery, from Port Fairy (November 18th, 1893), he states:—

"I generally put the cattle into the Marram grass enclosure after the first rains we get in April, and then allow them to graze there until the season begins to get too dry, when they are taken out and kept off till next season. I have been able to keep them longer in this season on account of the late rains we have had. During the last season I have had about 100 head of cattle grazing on about 100 acres of Marram grass for six months, and the cattle kept in fair condition during that time. There seems to be some doubt in the minds of a great many persons who have heard about Marram grass that it is of no value as a fodder, but I can assure you that the cattle at Port Fairy thrive well on it, and if it was not for this grass during the winter months the residents' cattle would fare badly. I am of opinion that it would make a splendid ensilage (*Melbourne Leader*, December 2nd, 1893)." Mr. T. E. Willis planted some Marram grass at Edward's Bay, Middle Harbour, but reported that they were eaten down by cattle. Baron von Mueller (*Select Extra-tropical Plants*, 1888 edition) says:—"Like *Elymus arenarius*, not touched by grazing animals." Dr. George Vasey says:—"This grass has no agricultural value." At Cape Cod Harbour the grass does not appear to be used for grazing purposes.

These statements may be reconciled as follows:—When fully grown, the Marram grass is notoriously a strong fibrous grass, beyond the power of cattle to digest, even if they are able to masticate it, but the young growth (and even larger growth if the season be moist and favourable), can be eaten by cattle, hence the protection a Marram grass plantation requires at this most critical period of its existence. It is a matter of common knowledge that many of our native tussocky and other grasses are browsed upon by cattle, while young and fairly succulent, but, on account of their harsh and wiry nature, they are absolutely uneatable when fully grown. The use of Marram grass must always, therefore,

be very subordinate from the point of view of pasture. Its value is that of a coast sand binder.

At the same time the question of keeping cattle away from newly-farmed Marram grass plantations must never be lost sight of. Fodder in such situations is harsh and sparse, and stray cattle will readily bite at the comparatively tender Marram plants just coming into growth, and perhaps exterminate a plantation unless checked.

I have since received the following letter from Mr. S. Avery, of Warrnambool, Victoria, which shows that the grass is a really valuable fodder grass :—"The Marram grass is edible during the whole of the year, and cattle will eat it at any time, but while there is plenty of rye grass and clover on the flats during the spring, the cattle prefer rye grass and clover to the Marram grass, but as soon as the grass begins to get scarce on the flats, the cattle then take to the sand-hills and feed on Marram grass during the winter months, and thrive well on it. Before the Marram grass was introduced into Port Fairy, the cattle running on the flats along the sea coast used to suffer severely from scouring, and a great many used to die from that cause, but now you will never find a beast scoured that grazes on the Marram grass plantations, it being of a binding nature as well as fattening. The Marram grass will only thrive well on barren sand-drifts, where it is impossible to get anything else to grow, and the greater the sand-drifts the better it thrives, and as a sand-stay it cannot be equalled."

A native of the shores of Europe and North Africa, Dr. George Vasey states that it grows on sandy beaches of the Atlantic, at least as far south as North Carolina and on the shores of the Great Lakes, but so far it has not been recorded from the Pacific Coast. It is, however, not indigenous to the United States, though from the account which has been given of Cape Cod Harbour it will be seen that it has been thoroughly acclimatised on the American continent.

Another possible use for Marram grass is suggested in the following letter, received at Kew, from Mr. R. W. Adlam :—

Joubert Park, Johannesburg,

August 23, 1894.

SIR,

I beg to return you my best thanks for the seeds received in two bags, as noted in yours of July 26. The *Ammophila* seed is very acceptable, as I wish to experiment with it to find if it will grow on, and bind together, the sand, or tailings heaps, which are accumulating so fast along the Main reef, and around this town. Our gold output is now five tons per month, and to obtain this a vast number of tons of rock have to be crushed.

The crushed gold-beating quartz—or rather sandstone, is first treated with mercury, and thereafter with cyanide of potassium, to obtain every particle of gold.

The cyanide remains in the tailings heaps, and, of course, is strongly poisonous. Blown about by the strong winds here, the sands cause serious eye complaints, and illness.

The question is, will any vegetation grow on such poison mountains—for so the tailings heaps may well be called.

I shall value your opinion on this serious subject.

I am, etc.,

(Signed) R. W. ADLAM.

The Director,
Royal Gardens, Kew.

DLXV.—AGRICULTURAL DEPRESSION.

It is a common fallacy to suppose that the state of things commonly spoken of as “agricultural depression” is peculiar to this country. It is a universal phenomenon of which the stress experienced in the United Kingdom is only a particular phase. It extends to cultural industries in every part of the world, though, from local causes, it is felt in some places more severely than in others. Nor is there any reason to suppose that it will diminish or be alleviated by palliative expedients. The causes are too deep-seated and permanent to be regarded as temporary. Mankind will, in fact, have more and more to reconcile itself to a new order of industrial conditions. The process will, no doubt, entail much individual loss and suffering. But this is inevitable, and is the accompaniment of all great changes. The problem must find its own solution, and will, in time, adjust itself.

The fundamental cause of the present state of things is the levelling influence on prices of modern facilities of transport. This includes a wide range of circumstances all conducing to the same end, and, in the long run, producing the same result. Such are :—the extension of railways, the construction of inter-oceanic canals, the use of iron for ship-building, and the application of steam to navigation.

How these causes act is well illustrated by the following extract from the *American Garden and Forest* of September last (p. 391) :—

“Since 1890 the wheat production of the country (United States) has been more than twice as great as it was in 1870, and there is no doubt that these large crops, added to the millions of bushels which are exported from India and the Argentine States, have supplied the world with more wheat than it can eat, or, at least, more than it is willing to pay for, and to this it must be added that Russia, Hungary and Spain have multiplied their production still more rapidly, while Australia threatens to put millions of bushels upon the markets of the northern hemisphere. But this is only one factor in a great change which has been going on all over the world during the last half of the century. In agriculture as well as in manufactures, science with inventions, which come from increased knowledge, have so cheapened production of every sort that the world we live in is quite a different one from the world of the early years of the present century. Machinery has so multiplied the power of a single man to cultivate and harvest and transport crops that a bushel of wheat can be raised, harvested and turned into flour in the distant west at less cost than it could be raised a few years ago in the rich

wheat-fields of northern New Jersey or Pennsylvania, and it costs actually less to put flour into the New York market from Minnesota than it cost our fathers to carry it fifty miles. With sulky-plows and horse-cultivators, with cheap fertilizers and a knowledge of how to apply them, the market-gardeners and truck-farmers of Virginia and southern New Jersey, by the aid of rapid transit, can sell fresh vegetables at a profit in this city for less money than they could have afforded to sell them on their farms a few years ago. It is owing to this cheap transportation that the fruit growers of the east are compelled to compete with a thousand car-loads of fruit brought into this city every year from California. When early apples from Canada come into competition with late winter apples from Australia in the English market, and perishable fruits like plums and peaches, raised in California, are sold in Liverpool, it is evident that the element of distance between the producer and the consumer of agricultural products is practically annihilated."

When this annihilation has been effected it is simply, in a great number of cases, a question whether the producer of any given commodity can face the competition of the world. If he can't, nothing will save him, and he must, before his capital is exhausted, devote his attention to some other industry.

Cultural industries will be limited then, in the long run, by the physical conditions of soil and climate, in the first place, and in the next, by the local cost of labour. The cultivation of the vine ceased in England, not because, as is often supposed, the climate became unfavourable, but because the produce of the ill-matured English grape could not hold its own in competition with that of France, when that became procurable. On the other hand, as already pointed out at some length in these pages (*Kew Bulletin*, 1895, pp. 307-315), vegetables, although they can be readily grown in this country, are largely imported from abroad, because the cost of production (and perhaps of transport) is cheaper. The pacification of Egypt has crippled the growth of onions in Bedfordshire.

In a few cases, but it is unlikely that they will ever be very numerous, the progress of discovery has superseded some staples altogether.

The manufacture of alizarine gave the death blow to the cultivation of madder. But synthetic chemistry has its limits, and it is improbable that mankind will ever be wholly satisfied with artificial substitutes for wine or for tea and coffee. Yet cheaper and perhaps inferior products will often press heavily on dearer and better ones. Cotton-seed oil is daily taking the place of that expressed from the olive. But economy is a more exacting factor in consumption than the gratification of a cultivated palate.

DLXVI.—FAT HEN IN AUSTRALIA.

(*Chenopodium album*, L.)

The plant referred to in the following communication turns out to be a familiar British plant. It is very commonly met with in Europe and temperate Asia as a weed of cultivation, probably

having its original home in the latter part of the world. It has spread to many climes. Bentham (*Flora of Australia*, vol. 5, p. 160) remarks:—"Whether it be really indigenous or introduced only into Australia is uncertain. In N. S. Wales and Queensland it is said to be known under the name of *Fat Hen*."

Kiel Villa, Nelson Street, Sans Souci,
N. S. Wales, May 12th, 1897.

DEAR SIR,

I SEND herewith a small packet containing a few seeds of a native vegetable—though only treated generally as a weed. The vulgar name it has is "Fat Hen"—poultry are fond of it when young, but those who use it as an article of diet call it "Australian spinach." I don't remember ever seeing a similar plant at home. In my early days when in the "bush" far away from centres of population I have been glad to eat this and enjoy it too, being unable to obtain vegetables, and in my opinion, also of others, think it superior to spinach, as it does not taste earthy and does not waste so much in boiling. It is everywhere a hardy plant growing freely at sea-level and on the high table lands of this colony. Any soil suits it, but it revels in a sandy loam, and does well with a fair share of moisture; the more rapidly it grows the more succulent and tender it is. Sow about the middle of May; transplant as cabbage, and when a foot to fifteen inches high take about 6 or 8 inches off the top, the portion left will throw out abundant lateral shoots right up to early winter; if left without topping will reach five feet high. The shoots become stringy if not taken away when young.

Hoping I have sent you something new and that it may be of use, or the means of introducing a fresh plant for food.

I am, dear Sir,

Yours faithfully,

A. R. FREMLIN.

W. T. Thiselton-Dyer, Esq.,
Royal Gardens, Kew.

DLXVII.—EUCALYPTUS TIMBER FOR STREET PAVING.

The use of Jarrah timber (*Eucalyptus marginata*) and Karri (*Eucalyptus diversicolor*) for paving carriage-ways in London, was noticed in the *Kew Bulletin* (1890, p. 188; 1893, p. 338). Since that time the use of these hard timbers, instead of soft woods, like yellow deal, has been extended. In the report of a Special Committee of the Paddington Vestry, appointed to consider the subject of wood paving in that important parish, the following recommendations have been made:—

28th May, 1896.

REPORT of the Special Committee appointed to Consider the subject of Wood Paving in the Parish of Paddington.

Your Committee have taken in hand the thorough investigation of the above-mentioned subject, having held four meetings, and considered carefully the evidence brought forward. Your Committee are unanimously agreed as to the imperative importance of

hard wood for public thoroughfares, and they entirely endorse the words of the Surveyor of Lambeth (J. P. Norrington, C.E.), "that it is a wicked waste of public money to pave a line of heavy traffic with soft wood."

Your Committee having seen sections of roadway paved with Jarrah, Karri, and other hard woods, subjected to most severe traffic, consider that the length of life of these woods has not been over-estimated, and that fifteen years is within the limits of trustworthy probability. Your Committee entertain very decided views as to the sanitary superiority of the Eucalyptus woods and their non-absorbent qualities.

As to the first cost of hard wood, they have had clear evidence that its great durability will not only cover the additional expense, but will realize an actual saving in the course of years, as well as make the necessity for renewals far more exceptional than can be possibly attained by the best treatment of the soft woods.

Your Committee have formed a strong opinion of the necessity of repaving Praed Street with hard wood, and that it should be so paved throughout its entire length as a whole. They also think it would be preferable to keep such thoroughfare in repair for another year rather than rush the re-paving thereof with soft wood, the material last used, according to the Surveyor's Report, having been down only for four and a half years.

The cost of maintenance of a deal wood road varies from year to year, so that whilst for the first three years the cost is very light, after four or five years it is very heavy. Thus since the last renewal in Praed Street in 1892-3, the maintenance in 1894 was £1 3s. 6d., in 1895 £10 13s., and in 1896 £73 19s. 8d., and to maintain such thoroughfare for another year will probably cost £100.

Your Committee consider the proposed experiment in Southwick Street as perfectly unnecessary in the face of the evidences afforded by the parishes inspected. They also consider change of road surface material on a permanent concrete bed to be a new work, and not in any sense a renewal, and consequently such undertakings may be met by loans if necessary.

Your Committee consider that the cost of renewing the existing soft wood paving in the parish will amount on an average to £7,000 per annum, but should hard wood be adopted they anticipate effecting a yearly saving of £2,000.

Under these circumstances your Committee unanimously recommend the use of hard wood blocks of not less than four inches in depth, for paving purposes in all suitable thoroughfares in the Parish, such blocks to be close jointed with creosote and pitch, and they further recommend that the proposal to pave Praed Street with yellow deal be reconsidered.

S. J. MACKIE (*Chairman*).

The following note headed "Wood Paving at the West End" appeared in the *Daily News* for the 17th August 1897 :—

"The Vestry of Paddington have borrowed £13,000 from the London County Council for the purpose of extending wood pavements in the parish. Already about eight miles of the streets of Paddington are paved with wood, but mostly soft wood. For

reasons of durability, cleanliness, and sanitation, the Vestry have now abandoned the use of soft deal in favour of hard wood, and have accepted a tender for the supply of 850,000 West Australian hard wood blocks at £10 17s. 6d. per 1,000 blocks.

DLXVIII.—GRAFTING SUGAR CANE.

The following article, which appeared in the *Hawaiian Planters' Monthly* (March, 1897, p. 101), has been communicated by the Editor (Mr. H. M. Whitney), who describes an experiment undertaken by himself about 20 years ago, which is believed to have resulted in producing a "hybrid" cane now largely grown in the Hawaii Islands.

The hybrid is understood to have been produced by grafting buds of the well known rich Lahaina cane on the stems of a hardy native cane called the "Kouala." The hybrid is said to be generally known as "Ko Wini" or "Whitney Cane," also as the "Yellow Bamboo."

The possibility of producing a graft-hybrid in the sugar cane has been a good deal discussed, but few people, without careful verification, would be prepared at once to admit that such a cane has actually been produced. Mr. Whitney's account, which is circumstantial enough in its details, is reprinted in the *Kew Bulletin*, but it is hardly necessary to add that this does not involve an endorsement of his belief that in this instance a hybrid cane was actually produced.

GRAFTING OF SUGAR CANES.

"The question of producing hybrid canes by grafting or budding is again being discussed, as though it had not been conclusively settled already, by actual results obtained in Brazil and Hawaii. A correspondent in the *Manchester Sugar Cane* of November last (page 577) quotes an old letter written by the late Charles Darwin relative to the hybrid canes produced in Brazil some forty years ago, in which Mr. Darwin doubted the correctness of the facts published.

"We have now in our possession a copy of the original official report of the Agricultural Department of Brazil translated by Mr. C. M. Nathan, of New Orleans, and published in the *N. O. Picayune*, in 1877. The statements made in this report appear to show conclusively that a hybrid was obtained by the process of splicing or 'apposition' of two halves of different varieties—the Cayenne and Molle, from which the St. Julian cane was obtained.

"A late number of the *Queensland Sugar Journal* refers to a successful experiment in that Colony by the same process of 'apposition.' It is possible that new varieties may be obtained in this way, provided that special care is taken to have the surface of the two halves perfectly smooth so as to fit each other closely, and care be also taken to prevent the juice and meat of

the canes from souring, by carefully waxing and covering the exposed parts of the splice. But it would seem to us that the character of the offspring would naturally be that of the half on which the bud or seed was located. We hope that the results obtained in Queensland will be fully reported later.

"Now, as regards hybrid canes in Hawaii. We have at least one genuine hybrid cane, which originated in Kau, Hawaii, in 1877-78. The editor of the *Planters' Monthly*—the writer of this article—was then engaged in cane planting at Keaiwa, Kau, near where the Pahala sugar mill is located, his land being from one to two thousand feet above sea level. The Lahaina variety, which is a rich, juicy, and prolific cane, while it is unsurpassed for lowland cultivation, is not at all adapted to the highlands on either of our islands, as it is extremely sensitive to cold, and becomes short-jointed and stunted. It was therefore desirable to find a cane which would thrive on the highlands, and yield the rich juice of the Lahaina. Among the varieties of native canes growing in Kau was a favourite one, called by the natives 'Kouala' (or potato cane), from the close resemblance of its meat to that of sweet potato. This variety seemed to thrive well at an elevation of 2000 to 3000 feet, where stalks of it were found growing twelve to fifteen feet in length, and of large girth. It was cultivated around the huts of the native mountaineers, and was one of their favourite foods.

"It occurred to the writer that if a hybrid could by any means be produced, combining the rich juices of the Lahaina with the prolific growth and hardiness of the Kouala, it would render cane planting more profitable on the elevated land where he was located, and even allow the cultivation of cane to be extended to the rich plateaus still higher up. With this object in view, a small nursery or 'experiment station' was prepared and joints or 'seeds' of several kinds of cane planted in it. Special care had been taken in preparing the ground, by deep digging, mellowing the soil and mixing in old manure, to insure the young plants a vigorous and healthy start. When these young canes were sufficiently advanced to allow it, grafting and budding in various modes were commenced and carried on for several months, in the same manner as that practiced with apple and other fruit trees in New York State, where the writer spent his younger years on a fruit farm and became familiar with the process. The grafting was done with a V incision on the topped growing stalk, great care being taken to have the graft fit into the incision as perfectly as a cabinet maker would insert a piece when mending furniture. Not only must it fit in shape exactly, but the eye or seed and the root germs of the graft must retain the same place in the stalk as the section had, that was cut out. The same care was observed in the budding operations—to have the inserted section fit exactly that of the bud and rootlets taken out. Some of these graft stalks were left growing in the hills, care being taken to cut out all the eyes or seeds below the graft, and to destroy all other stalks in each hill. The same precaution was taken in the budding operation. In each case, graft wax and bandages were used, as is customary with tree grafting. Some of these grafted and budded stalks were planted in the soil as canes are usually planted.

"As was expected, many of these grafts and buds died without showing any signs of vitality, while of the thirty or forty experiments made, some ten or twelve sprouted, throwing out two or more leaves from each bud. But one after another, they wilted and died, leaving a single plant, which from the start seemed to give good promise, and rapidly developed into a healthy hill. This nursery was located in the centre of what became a hundred acre field of Lahaina cane, and when the young plants had grown so as to cover the ground, this sole survivor of the nursery began to attract notice on account of its dark and straight leaves. As time went on, it became so conspicuous that passers-by would stop and enquire the cause of this unusual sight. Its growth was quite phenomenal, and stretching up its leaves above the canes around it, it stood like a sentinel alone in the middle of the field. It finally ripened into a hill of forty-two stalks, not one of which was less than eight feet, and from that to ten feet in length, and of large girth.

"The late Charles N. Spencer, then manager of the Hilea plantation, a few miles distant, was greatly interested in this new prodigy, and obtained a portion of the stalks, which were planted on the higher lands of that plantation, where, in the course of two or three years, he had a field of two hundred acres of it growing at an elevation of 1800 feet. From six hills of his first planting, he cut 226 stalks for seed, some of the stalks being twelve feet in length. He considered it the best upland cane he had, and named it 'Ko Wini' or 'Whitney Cane.' In Hamakua it has been called the 'Yellow Bamboo,' but this is identically the same cane as the hybrid originated by the writer. It has been planted on low lands in various districts of Hawaii, but it has nowhere done so well as in its native soil and climate of Kau. But for the object intended—a profitable upland cane—it has proved a boon to Kau, its birth place and home.

"Since the above was written, we have been informed by the local officers of the Pahala Plantation (Hawaiian Agricultural Co.), that they have been so well pleased with this hybrid cane, that they prefer it to other kinds. The value that they place on it may be inferred from the statement made by the treasurer, that of the four thousand acres of cane now growing on their plantation, they have 2854 acres of Whitney cane, 512 acres of Lahaina, and 654 of Rose Bamboo. And the outcome of sugar has been raised from 4000 tons of former years to 8000 tons as their last crop, and there is a fair prospect of obtaining a 10,000 ton crop in the near future. And more than this, they have a field of this new cane planted on land above the famous land-slide or "mudflow" of 1868, at an elevation of about 2200 feet. This field is a most remarkable one, showing some of the finest cane ever seen in the district. These results are certainly very gratifying to the originator of this hybrid cane, and creditable to the intelligent management of the estate, which has utilized the valuable discovery, so as to make Pahala plantation one of the best sugar properties in this group."

DLXIX.—GRAMA GRASS.

(Bouteloua oligostachya, Torr.)

The following correspondence relates to a proposal to introduce the North American "Grama grass" as a fodder-plant into India.

INDIA OFFICE to ROYAL GARDENS, KEW.

India Office, Whitehall, S.W.,
August 7, 1897.

SIR,

I am directed by the Secretary of State for India to forward a copy of a Memo. regarding "Grama grass," and to ask you to favour him with your remarks on a suggestion that has been made by a Scotch settler in Mexico that this fodder should be tried in India.

I am, &c.,
(Signed) C. E. BERNARD,
Secretary, Revenue and Statistics Department.

The Director,
Kew Gardens.

MEMORANDUM by Professor Wallace.

Grama grass (*Bouteloua oligostachya*), which is so valuable as a pasture grass in Mexico, Texas, and other adjoining states, is not grown in this country. Not only is the quality of its forage excellent, and its yield abundant under favourable circumstances of soil, and climate, but it has remarkable power of maintaining its existence in arid regions subject to long periods of drought. If it could be shown that the soil and climate of India are suitable to it (and this could be done at little expense at one of the experimental stations, such as at Poona), it would form a very valuable addition to the fodder grasses of the country. It is just possible, however, that if it were once established in arable land, it might become a troublesome weed to the cultivator, owing to the power its roots have of keeping possession of the soil.

Royal Gardens, Kew,
August 12, 1897.

SIR,

I have the honour to acknowledge the receipt of your letter (R. & S. 2212) of August 7 relating to the introduction of Grama grass into India.

2. I have consulted upon the subject with H. H. Rusby, Esq., M.D., Professor of Botany and Materia Medica in the College of Pharmacy of the City of New York, a well-known American botanist, who is now making researches at Kew. I enclose a copy of a letter with which he has favoured me. I also enclose an extract from Vasey's Report on the Agricultural Grasses and Forage Plants of the United States.

3. There can be no doubt that Grama grass as it occurs under natural conditions affords pasture of great value. How far these could be imitated artificially in India is another matter, and one I confess, which does not appear to me likely to be attended with much success.

4. If the experiment is considered worth the attempt seed could no doubt be easily obtained from the United States Department of Agriculture.

I am, &c.,
W. T. THISELTON-DYER.

Sir Chas. Bernard, K.C.S.I.,
India Office, Whitehall.

Kew, August 10, 1897.

DEAR SIR,

I am pleased to state the following in reply to your enquiry concerning the value of Grama grass for introduction to India.

There are quite a number of species of *Bouteloua* to which this term has been applied, and several of them are designated by special prefixes, as Black Grama, White Grama, Sand Grama, etc. Some of the species are closely limited as to environment, while others possess a wider power of adaptation. Hence some of them have remained little known, while others have acquired a high repute as pasture and hay-grasses. The best known are *B. oligostachya*, *B. polystachya*, *B. racemosa*, and *B. curtipendula*. All are more or less noted for the avidity with which stock will eat them, as well as for their nourishing properties. Animals show the same taste for them in the field, either green or dry, and in the stall. It is a peculiar property of these grasses to retain their nourishing properties after drying standing, and after remaining for many weeks in this position, exposed to the weather, a process which reduces ordinary grasses to the worthless condition of straws. Another notable property is their ability, especially *B. oligostachya*, to subsist in arid regions, where long-continued rainless periods destroy ordinary grasses. I have observed the following peculiarity of growth which doubtless accounts in some degree for this property. A single plant is seen to extend its growth in two opposite directions, forming a little ridge. These directions gradually change so that the ridge assumes a roughly circular form, enclosing a shallow basin which must do something to conserve slight rain-falls. A third important character of the plants is that they do not require the formation of a continuous sod, or turf, to maintain their condition. They are thus better adapted than many grasses to grow in those countries where sods or turfs will not form.

The trial of these grasses in India is to be strongly recommended. It is further to be recommended that a preliminary study should be made of the conditions of the locality where each is to be tried, so that failure may not result from planting the several species in unsuitable locations. The Black Grama is particularly adapted to rocky places, especially mountain-sides and the slopes of valleys. The White Grama (*B. oligostachya*) is most luxuriant in the rich loam of bottom-lands. It does very well, however, as does *B. curtipendula*, on desert plateaus, with gravelly or partly gravelly soil. *B. polystachya* is a much lower grass than the others, but makes a very dense growth and does remarkably well on sands of river-bottoms which are annually overflowed. It is the most valuable sheep-fodder of them all.

It is remarkable for the rapidity with which it is restored by growth as it is continually eaten off. Indeed, all the species are remarkable for the quickness with which they grow and mature upon the occurrence of rain.

My experience with these grasses as weeds in cultivated lands is slight, but it would tend to indicate that it is not their nature to act as weeds, or to persist in tilled lands.

Very respectfully yours,

(Signed) H. H. RUSBY.

The Director,

Royal Gardens, Kew.

EXTRACT from Vasey, *Grasses of United States*, Ed. 2, p. 57.

Bouteloua oligostachya (Grama grass; Mesquite grass) is the commonest species on the great plains. It is frequently called Buffalo grass, although that name strictly belongs to another plant (*Buchloe dactyloides*). On the arid plains of the west it is the principal grass and is the main reliance for the vast herds of cattle which are raised there. It grows chiefly in small, roundish patches closely pressed to the ground, the foliage being in a dense, cushion-like mass. The leaves are short and crowded at the base of the short stems. The flowering stalks seldom rise over a foot in height, and bear near the top one or two flower spikes, each about an inch long, and from one-eighth to one-quarter of an inch wide, standing at right angles like a small flag floating in the breeze. Where much grazing prevails, however, these flowering stalks are eaten down so much that only the mats of leaves are observable. In bottom-lands and low, moist ground it grows more closely, and under favourable circumstances forms a pretty close sod, but even then it is not adapted for mowing, although it is sometimes cut, making a very light crop. Under the most favourable circumstances the product of this grass is small, compared with cultivated grasses. It is undoubtedly highly nutritious. Stock of all kinds are fond of it, and eat it in preference to any grass growing with it. It dries and cures on the ground so as to retain its nutritive properties in the winter. No attempt is made by stockmen to feed cattle in the winter; they are expected to "rustle around," as the phrase is, and find their living; and in ordinary winters, as the fall of snow is light, they are enabled to subsist and make a pretty good appearance in the spring; but in severe winters there are losses of cattle, sometimes very heavy ones, from want of feed.

DLXX.—FLORA CAPENSIS.

The third and concluding part of the sixth volume of the work was issued in June.

The following extracts are given from the preface :—

The third volume of the *Flora Capensis* was published in 1865. The following year Professor Harvey, who had been its principal author and guiding spirit, died. Although in the preface the fourth volume is referred to as "shortly to be in preparation

for the press," practically nothing available relating to it was found amongst Professor Harvey's papers. Nor did his coadjutor, Dr. Sonder, who died in 1881, undertake any further part in the work.

Its continuation was urged upon Kew by Sir Henry Barkly, G.C.M.G., K.C.B., F.R.S., who was Governor of the Cape of Good Hope from 1870 to 1877. During a long official career in different parts of the Empire, this enlightened administrator, himself an ardent naturalist, never failed to foster the scientific interests of the colonies committed to his charge. Sir Joseph Hooker, at that time Director of the Royal Gardens, entrusted the task of continuing the work of Harvey and Sonder to me. But the pressure of official duties in which I almost immediately found myself immersed, left me little time for the task. It became evident that it could only be accomplished by the co-operation of numerous workers. Another difficulty was the rapid expansion of British South Africa. This led to a continuous influx to Kew of new material, which had to be determined and made available for future working up in the Flora. It was soon obvious that it would be necessary to largely extend the area comprised by the published volumes, and it was ultimately determined to do this still further so as to include, as far as possible, all known flowering plants occurring in the area between the Tropic of Capricorn and the Ocean. To the north, the present and future volumes will therefore be supplemented by the *Flora of Tropical Africa*.

During the last twenty years the time of one member of the Kew staff has been almost exclusively occupied with the determination of South African plants. Upwards of 10,000 specimens have been named and catalogued for South African botanists and collectors, and a considerable number have been figured and described. These labours were a necessary preparation for the continuation of the Flora on its extended scale.

For reasons of convenience it has been found advisable to publish the present volume in anticipation of the fourth and fifth, which are also in preparation, and to which it is hoped that Mr. Bolus, the well-known South African botanist, who has paid several visits to Kew for the purpose, will largely contribute. The present instalment will be found probably of more than ordinary interest to horticulturists as well as to botanists, as it includes the whole of the plants known familiarly as "Cape Bulbs."

The volume has been in preparation for several years, but its publication has been from time to time delayed by the desire to include in it the novelties which have been continually received and published as new territories have been explored.

Even while passing through the press sufficient have accumulated to render an appendix necessary. The whole has been elaborated by Mr. John Gilbert Baker, F.R.S., the Keeper of the Herbarium and Library of the Royal Gardens, who has long been the accepted authority on the Petaloid Monocotyledons. I must add my obligations to Mr. C. H. Wright, Assistant in the Herbarium, who has greatly helped me in reading the proofs.

The distribution of the localities under the different regions has been a laborious and intricate task. It will afford a basis for at any rate a partial analysis of the Flora of South Africa, which

will no doubt bring into prominence important facts as to its geographical distribution. It has been accomplished with much care and patience by Mr. N. E. Brown, A.L.S., Assistant in the Herbarium of the Royal Gardens. And finally it has been subjected to the invaluable revision of Mr. H. Bolus.

The orthography adopted for the local names has met with some criticism from South African botanists. It has been thought advisable, however, to adhere to the standard, no doubt in great measure conventional, of authoritative maps. Those which have been relied upon principally are :—

Cape of Good Hope. By J. Arrowsmith, 1834. (Useful for old names of localities.)

A Map of the Colony of the Cape of Good Hope and neighbouring Territories. By A. de Smidt, 1876.

Map of the Transvaal and the surrounding Territories. By F. Jeppe, 1880.

Spezial-Karte von Afrika. Gotha : Justus Perthes, 1885.

It only remains to follow the example of my predecessors, and give some account of those among a great body of contributors who have supplied Kew with the most important recent collections.

Two names will be for ever memorable in the history of South African Botany.

More than thirty years have rolled away since Professor Harvey bore eloquent testimony to the indefatigable services of Peter MacOwan, Esq., B.A., F.L.S., then Principal of Shaw's College, Grahamstown, now Government Botanist. Time has not staled his enthusiasm for the beautiful Flora amidst which he has spent the best years of his life, nor his energy in investigating it. Without his self-sacrificing aid the present undertaking would have been miserably incomplete. By a correspondence which has never intermitted, he has done all in his power to keep Kew abreast of the progress of botanical discovery in South Africa. And he possesses the happy art of communicating some touch of his enthusiasm to others, and has thus secured the investigation of many parts of the area of the Flora which might otherwise have remained all but unknown.

To Harry Bolus, Esq., F.L.S., the gratitude of Kew is no less due for aid and encouragement of the most varied kind. His admirable researches into the difficult problem of the geographical distribution of South African plants, and his patience and accurate investigation of the *Orchideæ* and other groups, will, it may be hoped, always ensure his close personal association with the present work. Mr. Bolus has further contributed to Kew many hundreds of specimens—a large proportion of which were new to science, and many of great interest and rarity.

At the risk of seeming to make an invidious choice amongst a formidable list of Kew contributors, I cannot but further single out the following for particular acknowledgement :—

Sir Henry Barkly, G.C.M.G., K.C.B., F.R.S., was indefatigable while Governor of Cape Colony in procuring for Kew many of the rarer and more remarkable of South African plants. He paid especial attention to those of a succulent habit. Amongst many interesting introductions to European cultivation, the remarkable tree-aloe (*Aloe dichotoma*) deserves especial mention. And it

was due to his support that the approval and aid of the Legislatures of Cape Colony and Natal was secured for the continuation of this work.

John Medley Wood, Esq. A.L.S., the Curator of the beautiful Botanic Gardens at Berea, Durban, in the Colony of Natal, and the only institution of the kind in South Africa, has investigated the Flora of Natal with conspicuous energy, and has done more than any other botanist to reveal its riches. Kew is indebted to him for large and invaluable collections.

The Rev. Leopold Richard Baur has sent to Kew a large and interesting collection of Tembuland plants, chiefly from the neighbourhood of Bazeia.

Maurice S. Evans, Esq., of Durban, has furnished collections which, though not numerically large, have proved very rich in new species.

H. G. Flanagan, Esq., has especially studied the rich local Flora of the Kei River Basin. Beautifully preserved specimens from him have reached Kew chiefly through Mr. Harry Bolus.

Ernest E. Galpin, Esq., of Queenstown, has sent collections rich in undescribed species from the Transvaal, Swaziland, and the Queenstown district.

Dr. Emil Holub contributed the entire collection made by him during his travels in South Africa between the years 1872 and 1879.

William Nelson, Esq., of Johannesburg, has sent an extensive collection of plants from the Transvaal and adjoining territory.

The Rev. William Moyle Rogers, of Bournemouth, has contributed a parcel of plants from various parts of Cape Colony, containing several novelties.

Mrs. Katharine Saunders has communicated from time to time interesting plants from Natal, Zululand, and the Lobombo Mountains.

William Tyson, Esq., of Kokstad, Griqualand East, has sent a large and interesting collection of plants from the Eastern districts of Cape Colony, Griqualand East, and Pondoland, containing numerous new species. He is commemorated in the Boragineous genus, *Tysonia*.

It only remains to add that the expense of preparation and publication of the present volume has been aided by grants from the Governments of Cape Colony and Natal.

W. T. T. D.

Kew, May, 1897.

DLXXI.—HANDLIST OF TENDER MONOCOTYLEDONS.

This further instalment of the detailed catalogues of the living collections in the Royal Gardens was issued in July. The following historical account is given in the preface of the history of the portion comprised in the present Handlist:—

The scope of the contents, which are somewhat heterogeneous, is dictated in great measure by convenience. It includes large

groups of plants of great scientific interest, which, for various reasons, are more attractive to ordinary cultivators than many which are comprised necessarily in a botanical collection. For this reason it is hoped that it may be found not less useful than its predecessors.

A few words may be said as to the history at Kew of the more important of the groups now catalogued.

SCITAMINEÆ.

An order including gingers, arrowroot-plants, and musas. It numbers some 450 species, of which 240 are in cultivation at Kew. Almost all are natives of the tropics. About 40 species are given in 1813 in the second edition of Aiton's *Hortus Kewensis*, and 139 by John Smith, Curator of the Royal Gardens, 1841-63, in his privately printed *Records of Kew* (p. 222) as forming "the Kew collection between the years 1822 and 1864."

Musa Ensete, one of the most popular representatives of the family and a conspicuous ornament of the gardens of Southern Europe, was first introduced into cultivation at Kew. In 1853 Walter Plowden, Esq., H.B.M. Consul at Massowah, Abyssinia, sent seeds from which plants were raised, one of which was ultimately figured in the *Botanical Magazine* (tt. 5223, 5224).

Strelitzia Reginae, a beautiful plant, which almost certainly preserves an unbroken descent at Kew, was named by Sir Joseph Banks in honour of Queen Charlotte, a daughter of the Duke of Mecklenburg-Strelitz, but of which, with characteristic modesty, he allowed the elder Aiton to publish the description. Banks had introduced it to the Royal Gardens in 1773 from the Cape of Good Hope.

Strelitzia Augusta was introduced in 1791 by Francis Masson, the botanical collector for the Royal Gardens, where it has been cultivated ever since. It may have been named in compliment to the Princess Augusta, mother of George III.

The collection is dispersed, according to the habits of the plants and the different treatment they require, between the Palm House, No. I., the Stove (No. IX.), and the Water Lily House (No. XV.). A few are represented in the Temperate House.

BROMELIACEÆ.

The order of which the pine-apple is a familiar representative; the species are mostly epiphytal on trees and exclusively natives of the New World. According to Aiton's *Hortus Kewensis*, 16 species had been introduced at Kew previous to 1813. In 1864 Smith states (*Records* p. 206) that the number amounted to nearly 100.

In *Appendix II.* to the *Kew Report* for 1878 a list of species cultivated at that time was given, numbering 147. The extent of the collection was much increased by the purchase in 1886 of a large selection from that formed by the late Professor Edouard Morren, of Liège, which was at the time probably the richest in existence. The number of species comprised in the present list amounts to 252.

Mr. J. G. Baker, F.R.S., the present keeper of the Herbarium of the Royal Gardens, based his invaluable *Handbook of the*

Bromeliaceæ (1889) in great measure on the Kew collection of living plants, supplemented by the unique collection of drawings also formed by Professor Morren and acquired by the Bentham Trustees for the Kew Library.

For many years the collection of *Bromeliaceæ* was grown in the Palm House. The atmosphere was, however, too dry for their successful cultivation, and in 1883 they were removed to the Stove (No. IX.) and Victoria House (No. X.)

CAPE BULBS.

The orders *Hæmodoraceæ*, *Iridææ*, *Amaryllidææ*, and *Liliaceæ*, though widely dispersed, are represented in especial profusion in South Africa, and the species from that part of the world are collectively often spoken of in cultivation as "Cape Bulbs." The sixth volume of the *Flora Capensis* is entirely devoted to their description.

At the instance of the Royal Society the practice was commenced in 1772 of sending out collectors of plants to foreign countries from Kew. Francis Masson, in whose honour the genus *Massonia* was named, twice visited the Cape of Good Hope for this purpose; first, from 1774-6; and secondly, from 1786-95. He "collected and sent home a profusion of plants unknown till that time to the botanical gardens in Europe."

James Bowie (commemorated in *Bowiea*) collected at the Cape for Kew from 1817-23. He introduced amongst numerous other plants the well-known *Clivia nobilis*.

The method of growing Cape bulbs in this country originally adopted at Kew is thus described by Smith (*Records*, pp. 312, 313):—"The garden collection of bulbs were grown in glazed frames, called the bulb borders, attached to the fronts of the Botany Bay, Cape, and Palm Houses, the length of the whole being 234 feet, width 5 feet. They received heat from the flue that heated the house through openings left in the brickwork, and in severe winters they were protected by shutters. In these borders the principal of Masson's and Bowie's collections were well maintained for many years."

This system, which has been since reverted to partially, is admitted the best when the bulbs are planted out. But for the bulk of the collection it is more convenient to grow them in pots. When at rest these are kept in a private house (No. XVII. c.), from which, when in flower, they are removed to the Cape House (No. VII.).

No trustworthy statistics are available as to the number of species of tender bulbous plants cultivated at earlier periods at Kew. But the numbers enumerated in the present list are:—*Hæmodoraceæ*, 28; *Iridææ*, 221; *Amaryllidææ*, 488; *Liliaceæ*, 512; making a total of 1249.

YUCCAS, ALOES, AND AGAVES.

Aloe (to which may be added *Haworthia*) and *Yucca* ("Adam's-needle") belong to the order *Liliaceæ* *Agave* to *Amaryllidaceæ*. In habit they have all many points of resemblance, and the majority flourish under similar cultural conditions. Hence *Agave*, though it has no near botanical affinity with *Aloe*, is often called

the "American Aloe." The bulk of the Kew collection is to be found in the Succulent House (No. V.). *Aloe* and *Haworthia* are confined to the African region, *Yucca* and *Agave* are exclusively American. Of the group of *Aloineæ* nine species are recorded by Hill as grown at Kew in 1768, and 29 by Aiton in 1814. The collection was greatly enriched by the mission of James Bowie to South Africa in 1817-23, and a large number of species were introduced which were described by Haworth; few of these have probably been lost since that time. The collection was largely enriched in 1889 by purchases from the celebrated collection of the late John T. Peacock, Esq., of Sudbury House, Hammersmith. A selection from his extensive collection of succulents had been temporarily exhibited in the South Octagon of the Temperate House from 1878-81 (*Kew Report*, 1878, p. 6). *Appendix II.* of the *Kew Report* for 1880 gave a catalogue of the *Aloineæ*, *Yuccoideæ*, and *Agaves* cultivated in the Royal Gardens, including those in the Peacock collection. It enumerates 296 species.

Those catalogued in the present Hand List amount to 377.

One of the most interesting introductions of recent times is the great Natal Tree-Aloe (*Aloe Bainesii*), of which the first plant in European gardens was raised from a cutting sent to Kew in 1867 by Mrs. Barber. It is figured in the *Botanical Magazine* (t. 6848). The other African arborescent species (*A. dichotoma*), which has been lost to cultivation, was re-introduced by Sir Henry Barkly, G.C.M.G., K.C.B., Governor, Cape of Good Hope, 1870-7.

The history of a specimen of the arboreous *Yucca filifera* of North-East Mexico is sufficiently remarkable to deserve notice. "The trunk was sent to Kew in October, 1888, by Mr. C. G. Pringle, through Professor Sargent. When it arrived at Kew it appeared to be quite dead, and was accordingly placed in Museum No. III. After remaining there two years it put out rudimentary leaves and an inflorescence, and on being transferred to the Temperate House these were fully developed in September, 1890." Unfortunately, after this effort, it finally succumbed. It is figured in the *Bot. Mag.* (t. 7197).

PALMS.

Palms form an order of plants which is conspicuously distinct from all others. Their salient characters are indeed familiar at a glance. The majority are natives of the Tropics, and therefore in this country require a high temperature for their cultivation. The greater number are natives of the New World, and in the old Africa is poorest in species. A few are found in extra-tropical countries, and to these the gardens of Southern Europe owe much of their striking character and beauty. The *Kew Bulletin* for 1889 (pp. 291-297) contain an account of the species cultivated on the Riviera. In this country these require the protection of glass; but one, *Trachycarpus excelsa*, a native of China, is hardy out of doors.

The total number of species actually known to botanists is upwards of 1100, but many doubtless still remain to be described.

In 1768 six species were enumerated in Hill's *Hortus Kewensis* as in cultivation at Kew. In 1787 Aiton in his *Hortus Kewensis*

gives 10, and in 1813, in the second edition, 20. Smith states (*Records*, p. 96) that in 1830 the collection had increased to 40 species and enumerates 141 species as cultivated in the Royal Gardens from 1760-1864 (pp. 98-106). *Appendix II.* to the *Kew Report* for 1882 (pp. 53-73) contains a classified list of the Palms cultivated in the Royal Gardens; this includes 370 species.

The number catalogued in the present Hand List amounts to 407. Of these 40 are represented in the Temperate House. This is probably the largest assemblage of species of the order to be found in any one place in the world. It is doubtful whether it does not exceed that in the Botanic Garden at Buitenzorg, in Java, which in any case excels the Kew collection in the magnitude of individual species if it does not actually do so in the number cultivated.

In 1820, according to Smith (p. 96), the palms "occupied a lean-to house called the Palm House which stood about 100 feet north of the west end of the present Fern House (No. II.) : it was 60 feet long, 16 feet wide, and 15 feet high at the back." In 1828, to accommodate the increasing size of the specimens, "the house was raised four feet."

He continues:—"In 1830 the collection had increased to 40 species, which necessitated placing some of them in other houses. During the latter years of the reign of George III. and George IV., a new Palm House was contemplated, and a plot of ground set apart for its erection; but nothing was done until the accession of William IV., who took much interest in improving the Gardens. In 1834 a plan for a spacious Palm House was prepared by the celebrated architect, Sir Jeffrey Wyatville, and in October, 1834, a spot was selected and the length of the house marked out in the presence of the King."

The project was not, however, carried out, and it was not until the Royal Gardens became a public institution that it was accomplished. The present building was completed in 1848, from the designs of Decimus Burton, Esq. The length of the structure is 362 feet; its width in the centre 100 feet, and height 66 feet; the wings are 50 feet wide and 30 feet high.

The oldest palm in the house is *Sabal blackburniana*. Of these there were two specimens, one of which was taken down for want of room in 1876. Smith (*Records*, pp. 122, 123) gives the following account of them:—"On my entering Kew in the Spring of 1820, the first hot house I came to was the Palm House; on looking in I was struck with what I then considered a wonderful plant, a large-leaved Fan Palm; and I found there was another of the same kind and size at the other end of the house There is no record of their introduction in the Garden books Probably they formed a part of the great collection of plants introduced by Admiral Bligh in 1793, on his return home after having introduced the Bread Fruit tree into the West Indies." The history of the palm has, however, always been enveloped in confusion. Its native home has been shown in the *Botany of the Challenger Expedition* (Part I., pp. 70-3) to be Bermuda. A figure of the Kew plant is given on Plate V. of that work.

A few other old specimens may be mentioned. The large plant of *Jubæa spectabilis* in the Temperate House is no doubt one of

"several plants raised from seeds collected in Chili by the botanical collector, Thomas Bridges, and purchased from his agent, H. Cumming, in 1843" (Smith, *Records*, p. 111).

Trachycarpus martiana is represented in the Temperate House by two fine specimens purchased "at the sale of the collections that ornamented the Conservatory of the Royal Horticultural Society's Gardens, South Kensington, in 1889. They are supposed to have been originally obtained from the garden of the Duke of Wellington at Strathfieldsaye." One is figured in the *Bot. Mag.* (t. 7128).

Howea belmoreana.—"This palm was discovered by W. Milne, botanical collector (1852-9) for Kew on the surveying ship 'Herald,' Captain Denham. One plant was received at Kew." (Smith, *Records*, p. 115.) It is peculiar to Lord Howe's island and was long grown at Kew under the name of *Veitchia canterburyana*. The Kew plant is figured in the *Bot. Mag.* (t. 7018), where it is stated to have been sent from the Sydney Botanical Gardens.

Trachycarpus excelsa is represented by specimens in different parts of the grounds. The history of the old specimen near the principal entrance (which formerly stood in front of No. I. house may be recorded. A native of Chusan and the North of China, it is one of "six plants . . . received in 1845 from Mr. Robert Fortune, a well-known Chinese plant collector" (Smith, *Records*, p. 116).

Palms in cultivation are slow in developing the full size of their crowns. But when once this stage is achieved the upward growth of the stem is comparatively rapid. But the time is reached when the dome of the Palm House is unable to accommodate their height, and it is then necessary to cut them down and replace them. A great clearance was made from this cause in 1876 (*Report*, p. 4). Perhaps the greatest ornament of the Palm House which was felled at this date was the stately plant of *Livistona humilis*, figured in the *Bot. Mag.* (t. 6274). According to Smith (*Records*, p. 118), it had been received in 1824 as a germinating seed sent in a case from Australia by Allan Cunningham.

SCREW PINES.

The *Pandanaceæ* are an order of trees or shrubs allied botanically to Aroids, but differing widely in habit. They are all tropical or nearly so, and natives of the African islands and those of the Pacific and Indian Oceans. Including *Cycelanthaceæ*, some 115 species are known, and of these about half are in cultivation at Kew, mostly in the Palm House. According to Smith (*Records*, pp. 126-7) in 1864 the number of species grown in the Royal Gardens was 15.

The collection has been much increased by the plants raised from seeds brought from Rodriguez in 1874 by Professor Bayley Balfour when attached as naturalist to the Transit of Venus Expedition.

Two notable plants which were long perhaps the most striking features in the North Wing of the Palm House no longer exist. Their prospective removal on account of size was foreshadowed

in the *Kew Report* for 1876 (p. 4), but it was not accomplished, and in the one case not by design, till nearly twenty years later. The following particulars respecting them were given in the *Kew Bulletin* for 1895, pp. 319-321.

Pandanus odoratissimus.—There is no record of the original introduction of the striking plant which, under this name, occupied a conspicuous position at the extreme end of the north wing. Smith mentions its existence (*Records*, p. 96) in 1823. Unfortunately screw pines grow only from the extremities of their branches, and do not when cut in produce new growths by the development of adventitious buds. No ordinary horticultural building can therefore eventually accommodate them, and their removal on account of unmanageable size is only a question of time. Before its removal the great Kew Screw Pine “had about 40 branches, each bearing a huge tuft of foliage, and it measured 30 ft. in height, with a diameter of 40 ft. Its weight would be about 6 tons.”

It was a female plant and first fruited in 1883, and produced its large heads of fruits about a foot long almost every subsequent season. It was removed in 1894 and was then bearing five heads. Up to 1882 it was grown in a tub, and there is a good figure of it in that stage in the supplement to the *Gardeners' Chronicle* for August 5th, 1876. In that year it was lowered into a brick pit prepared for the purpose and so gained an additional space in height of 5 ft. The base of the stem with the mass of aerial roots has been carefully preserved for future exhibition in No. III. Museum. An illustration was published in the *Gardeners' Chronicle* for January 5th, 1895. *P. odoratissimus*, Roxb., is reduced in the *Flora of British India* to *P. fascicularis*, Lam.

Pandanus reflexus.—This was a striking plant of great size which stood at the end of the north wing near the staircase. It immediately attracted attention from its dense heads of enormous stiff sword-shaped leaves. According to Smith (*Records*, p. 126) it was introduced to Kew by Wallich in 1818. *P. reflexus* is an obscure species said to be a native of Bourbon. Whether the Kew plant was correctly referred to it will perhaps never be known with certainty. It was a male plant, and the correct determination of plants of this sex presents great difficulties.

In July, 1889, a large plant of *Pandanus odoratissimus* was received from the Oxford Botanic Garden and planted in the Palm House immediately opposite the *P. reflexus*. It died in the following November, apparently from the same disease as eventually also killed the larger plant. In 1891 it was noticed that the foliage of this had a somewhat yellowish and unhealthy appearance. The great heads of leaves then began one by one to fall over, evidently from a rotting of the stem at the “neck.” They were removed, but the mischief continued and eventually it became necessary to sacrifice the whole plant. The disease was almost certainly due to the attacks of a fungus, *Melanconium Pandani*, which has been very destructive to Screw Pines in European Botanic Gardens.

AROIDS.

Aroideæ are a well-marked order of plants represented in our own flora by the “Cuckoo-pint” of our hedge-rows. Some

900 species are known, of which 360 are cultivated at Kew. They vary in habit from terrestrial herbs to tall climbers. A large proportion are tropical and these have since 1863 been cultivated in No. I house, the architectural conservatory removed by William IV. in 1836 from Buckingham Palace to serve the purpose of a Palm House.

Aiton, in the first edition of the *Hortus Kewensis* (1787) records 20 species; the second (1813) gives 44 as grown at Kew. Smith (*Records*, p. 92) enumerates 148 as in cultivation in 1864. In *Appendix II.* to the *Kew Report* for 1877 a catalogue is given of 250 species and varieties.

One species, without doubt the most remarkable of the order, *Amorphophallus Titanum*, is no longer in the Kew collection. A full description of it is given in the *Bot. Mag.* (tt. 7153-5).

Sir Joseph Hooker writes:—"The plant, which flowered in June, 1889, was received by Sir Joseph Hooker from Dr. O. Beccari, through the Marchese Corsi Salvati, of Sesto, near Florence, exactly 10 years previously (June 1879). It was then a small seedling which had been raised at the Botanical Gardens at Florence from seeds forwarded by Dr. Beccari soon after he discovered the plant in Sumatra in 1871." The Kew plant did not mature seeds and died after flowering. A full-sized picture of the species may be seen on the ceiling of Museum No. III.

GRASSES.

The number of grasses which it is worth while to grow under glass is not large. Two of the largest Bamboos are noteworthy features in the centre of the Palm House:—*Bambusa vulgaris* and *Dendrocalamus giganteus*. The former has been in cultivation at Kew from the beginning of the century. The latter, which was one of Wallich's discoveries in the Malay Peninsula, reached it later, probably from the Royal Botanic Garden, Calcutta.

In the Victoria House there is growing in the tank a fine specimen of *Gynerium saccharoides*, the "Uva grass" of commerce. It was sent to the Royal Gardens in 1875 by Dr. Capanema from Rio de Janeiro, and occasionally flowers. It is figured in the *Bot. Mag.* (t. 7352).

DLXXII.—FIJI IVORY NUTS.

In the Fiji Court of the Colonial and Indian Exhibition, in 1886, there were exhibited by the Mango Island Company, Limited, a collection of food and other products. Among them were some hard, white seeds, with the simple label "Ivory nuts." A sample of these was obtained, at the close of the Exhibition, for the Museum of the Royal Gardens, but their botanical origin could not then be traced. Recently samples of the actual seeds were sent out to Mr. D. Yeoward, Curator of the Botanic Station at Suva, Fiji, with a request that he would endeavour to identify them.

In a letter, just received, Mr. Yeoward referred them to the "Niu Sawa" (*Veitchia Joannis*, Wendl.), a palm discovered in

Fiji by Dr. Berthold Seemann, and introduced into cultivation, in European gardens, by Mr. John Veitch. A figure is given in Nicholson's *Dictionary of Gardening*, vol. IV., 139. The seeds are described in Seemann's *Flora Vitiensis*, p. 271. "The kernel is ovoid ellipsoid, tapering into a rather blunt point, 30-35 mm. long and 2 cm. in diameter, and attached, from the base to the apex, to the endocarp by means of the raphe, from which rise a number of delicate white vascular bundles. At the base these are placed parallel to each other, but towards the point overlying each other. The albumen, surrounded by a purple-coloured skin, is hard, white, even, and encloses a straight embryo.

"This palm," says Seemann, "is found all over Viti, and there is reason to believe that it is also found in the Tongan group, where, as in Fiji, it is known by the name of 'Niu Sawa,' I am told; Sawa, signifying red in Tonganese (and having no meaning in Fijian), doubtless in allusion to the fruit, which merges from bright orange into red. The spadix, on which the minute monœcious green flowers are inserted, is much branched, and the branches form large bunches, which, when loaded with ripe fruit, are rather weighty. As many as eight of these bunches are often seen on a tree at one time in various stages of development. The fruit is about the size of a walnut. At first green, it gradually changes into bright orange, and ultimately merges into red at the base. The kernel has a slight astringent taste, and is eaten by the natives, especially by the youngsters."

It will be observed that there is no mention here of the kernels becoming hard, or ivory-like, or of their use except in the young and soft state. It seems possible, however, that in the hard and dried condition of those shown at the Colonial and Indian Exhibition, they may be used for making buttons and other small articles similar to those prepared from the common ivory nuts of South America.

CURATOR, BOTANIC STATION, FIJI, TO ROYAL GARDENS, KEW.

Suva, Fiji, 30/9/96.

SIR,

I have the honour to acknowledge the receipt of yours asking information on the ivory nut exhibited by the Mango Island Company at the Colonial and Indian Exhibition of 1886. The nut is believed here to be that of the native "Niu Sawa," a palm which grows to a great height, and is named by Seeman (*Veitchia Joannis*). But, of course, native names are not to be relied on, and he might have received the name of Niu Sawa for some other palm, although his description answers fairly well to the seeds of one I am sending you. In the meantime, I will prepare specimens of the flowers and a leaf, and if you should want them, they will be ready for you. I have cleaned two of the seeds, and send you some dozen or so for planting. You will see that those cleaned are almost identical with the one you sent, except, of course, the two cleaned are fresher, and not quite so hard.

Yours most obediently,
D. YEOWARD,
Curator.

DLXXIII.—ADDITIONS TO LIST OF KEW PUBLICATIONS, 1841—1895.

In the prefatory note to the list published on pp. 1-84 it was remarked as probable that some publications which should have been included, "have eluded research or have been overlooked." This proves to have been the case, and the following supplementary list has been prepared by B. Daydon Jackson, Esq., Sec. L.S.

1867.

The Cultivated Selaginellas. By J. G. B[aker], Gard. Chron., 782-783; 902-903; 950; 1120; 1190-91; 1241.

1868.

The genus *Funkia*. By J. G. B[aker], Gard. Chron., 1015.

(P. 26, NOTE.—In Harvey's Genera of South African Plants, ed. by J. D. Hooker, the Filices were written by J. G. Baker, pp. 458-471.)

Synopsis Filicum; or, a Synopsis of all known Ferns, including the Osmundaceæ, Schizæaceæ, Marattiaceæ, and Ophioglossaceæ, chiefly derived from the Kew Herbarium, accompanied by figures representing the essential characters of each genus. By the late W. J. Hooker and J. G. Baker. [NOTE.—Pp. 1-55 by Sir W. Hooker, the remainder by Mr. Baker.]

1869.

Refugium Botanicum; or, Figures and Descriptions from Living Specimens, of little known or New Plants of Botanical Interest. Edited by W. W. Saunders. The descriptions by . . . J. G. Baker, . . . the plates by W. H. Fitch, vol. i.

Epilobium obscurum, Schreb. in Orkney or Shetland. By J. Britten, Journ. Bot., vii., pp. 340-341.

1870.

The Known forms of *Yucca*. By J. G. Baker, Gard. Chron., pp. 828; 923; 1088; 1122-1123; 1183-1184; 1217.

Martius, Flora Brasiliensis, vol. i, pars. II., pp. 306-624. Cyatheaceæ et Polypodiaceæ exposuit. J. G. Baker.

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by J. G. Baker, vol. iii.

Remarks on *Asarum europæum*, Linn. By J. Britten. Journ. Bot., viii., pp. 84-86.

On a new locality (Herefordshire) for *Asarum europæum*, Linn. By the same, l.c., p. 161.

Viola Paillouxii, Jord., identical with the Cornfield Pansy. By the same, l.c., pp. 223-224.

[Additions to T. A. Preston's] Flora of Marlborough. By the same, l.c., pp. 324-325.

1871.

Martius, Flora Brasiliensis, vol. xiv., pars. II., pp. 173-219. Connaraceæ et Ampelideæ. J. G. Baker.

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by J. G. Baker, vol. iv.

Protandry in *Butomus umbellatus*, Linn. By J. Britten, Journ. Bot., ix., p. 17.

Additions to the Flora of Marlborough. By the same, l.c., p. 374.

1872.

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by J. G. Baker, vol. v., parts 1 & 2.

1874.

Synopsis Filicum . . . By the late W. J. Hooker and J. G. Baker ed. II.

1875.

Carnivorous Plants. By J. D. Hooker. (Rep. Brit. Assoc., 1874.) Reprinted in Journal of Eastern Asia, i., pp. 38-62.

1878.

On some of the Economic Plants of Morocco. On the Canarian Flora as compared with the Moroccan. Comparison of the Moroccan Flora with that of the mountains of Tropical Africa. App. D. E. F. [by J. D. Hooker] in "Journal of a Tour in Morocco, by J. D. Hooker & J. Ball."

Determination by [D. Oliver] of Plants collected near Akaba by Mr. JOHN MILNE on Dr. Beke's Expedition to Sinai, in Arabia, January and February, 1874. In the late Dr. Charles Beke's Discoveries in Arabia and Midian, pp. 593-594.

1880.

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by J. G. Baker, vol. v., part 3.

Note.—The date on the title-page is "1873."

1883.

English Botany; or, Coloured Figures of British Plants, Ed. III. . . . by J. T. Boswell (formerly J. T. Boswell Syme), [revised and figures added by N. E. Brown,] vol. xii. Nos. 84, 85.

1884.

English Botany . . . [revised by N. E. Brown,] Nos. 86, 87.

1885.

English Botany . . . [revised by N. E. Brown,] No. 88.

1886.

English Botany. . . No. 89. Index to the whole work, by N. E. Brown. The complete volume is dated 1886.

1887.

List of Economic Plants of Western Africa, [by J. M. Hillier.] In Moloney's Sketch of the Forestry of West Africa, pp. 269-458.

1888.

Les Cypripédiées, texte par A. Godefroy-Lebeuf
N. E. Brown—1 re Livraison.

The Vegetable Resources of the West Indies, by D. Morris,
Journal London Chamber of Commerce, April, 1888.

1891.

English Botany; or Coloured Figures of British Plants.
Supplement to the Third Edition, Part 1. [Ranunculaceæ-
Celastraceæ] compiled and illustrated by N. E. Brown.

1893.

English Botany . . . Parts 2 and 3 [Sapindaceæ-Dipsaceæ.] . . .
by N. E. Brown.

DLXXIV.—MISCELLANEOUS NOTES.

Mr. JOHN MAHON, a member of the Staff of the Royal Gardens, has been appointed, on the recommendation of Kew, by the Secretary of State for Foreign Affairs, to the post of Forester under the British Central African Protectorate.

Long Reign Celebration.—On June 22, the day of the Official Celebration of Her Majesty the Queen's long reign, the Royal Gardens were closed to the public by order of H.M.'s First Commissioner of Works and Public Buildings, in order to give the members of the Staff and employés an opportunity of seeing the Queen's progress through London. A Royal Standard, lent by the Admiralty for the occasion, was flown from the Douglas Spruce Spar, believed to be the tallest in the Old World.

Honours for Indian Botanists.—Amongst the honours bestowed by the Queen on the occasion of the celebration of Her Majesty's long reign, two will be peculiarly acceptable to the botanical world. Both Sir Joseph Hooker and Lieut.-General Strachey were promoted to be Knights Grand Commander of the Star of India. This is one of the most restricted honours in the gift of the Crown. The association of the two names in the same Gazette was peculiarly felicitous. While the former was exploring the Eastern, the latter was occupied with the same task in the Western Himalayas. General Strachey's botanical collections made at the time have never been surpassed or superseded, and supplied indispensable material for the preparation of the *Flora of British India*.

Botanical Magazine for June.—The plants figured are : *Renanthera Storiei*, *Strobilanthes callosus*, *Veronica diosmæfolia*, var. *trisepala*, *Begonia Baumanni*, and *Lælia longipes*. The *Renanthera* is a magnificent species from the Philippine Islands. The drawing was made from a specimen communicated by Sir Trevor Lawrence. *Strobilanthes callosus*, native of Western India, was raised from seeds sent to Kew from the Saharanpur Botanical Gardens. The bracts yield a resinous substance which has an odour resembling Patchouli (see *Kew Bulletin*, 1896, p. 98). The *Veronica* is a variety of one of the numerous shrubby species from New Zealand, the specimen drawn being sent to Kew from the Royal Botanic Gardens, Edinburgh. *Begonia Baumanni* is noteworthy on account of its ornamental flowers being fragrant. It is a native of Bolivia, and flowered at Kew in September, 1896. The *Lælia* is a small-flowered species from Brazil, allied to *L. crispilabia*. The plant figured was sent to Kew by Messrs. F. Sander & Co., of St. Albans, in 1893, and flowered for the first time in July, 1896.

Tropical African Plants.—A large and interesting collection from Nyasaland, made by Mr. Alex. Whyte and others, has been presented by Sir H. H. Johnston, K.C.B., late H.M. Commissioner in British Central Africa. The country explored comprises Zomba and its vicinity, Mt. Malosa, the Nyika Range, and the country between Kondowe and Karonga. An account of this journey has been published in the numbers of the *British Central African Gazette* between October, 1896, and February, 1897. The collection, which contains some 200 new species, is especially rich in Rubiaceæ, and gives a very complete idea of the vegetation of the region traversed.

Prof. A. Engler, Director of the Botanical Gardens and Museum, Berlin, has presented collections, rich in novelties, from Usambara and various other parts of German East Africa, made by Holst, Baumann and Stuhlman. A set of the plants collected by Zenker, in the Cameroons, has been contributed by Dr. E. Gilg.

Mons. W. Barbey has sent specimens of the plants collected, chiefly in northern Abyssinia, by Dr. G. Schweinfurth, which are in course of publication in the *Bulletin de l'Herbier Boissier*.

An interesting collection, made in N'gamiland by Major F.D. and Lieut. E. J. Lugard, has been received from the collectors, and contains many undescribed species. The plants collected in Sokotra and South Arabia, by the late Mr. Theodore Bent, have also been presented to Kew.

Fruit Industries in Jamaica.—Owing to the depression in the sugar industry in the West Indies, considerable interest attaches to the development of other industries likely to prove serviceable in such islands as are fortunate enough to possess the necessary conditions. In Jamaica, for instance, with a considerable extent of land rising above the level of the sea a diversified system of cultivation is practicable, and already leading to successful results. From the Blue Book of Jamaica, it appears that the total exports for the year 1895–96 were of the value of £1,873,105. Of this amount the exports to the United Kingdom were of the value of £517,504, while those to the United States were of the value of £1,067,186. The considerable trade now carried on between Jamaica and the United States is chiefly in fruit and other fresh tropical produce conveyed by a considerable fleet of steamers specially fitted for the purpose. The principal fruit cultivated is the banana. Of this, 4,220,796 bunches were exported in 1895–96 of the value of £316,560, while oranges, owing to the recent destruction of the orange trees in Florida, were exported to the number of 97,925,398, and the value of £169,794. These two fruits were therefore shipped to the value of £456,354. During the same period the exported value of sugar (formerly the chief staple of the Colony) amounted to only £195,459, while the value of the rum was £164,600. The combined value of the exports in sugar and rum was therefore £360,059, only one-fifth of the whole produce of the Colony or about £200,000 less than the combined value of two of the fruits exported, viz., the bananas and oranges. Jamaica has, however, other valuable industries; the logwood exported in 1895–96 reached, in spite of low prices, a value of £359,039, coffee a value of £284,821, ginger a value of £50,328, pimento or allspice a value of £90,046, cigars a value of £7,649, and tobacco a value of £197. It may be mentioned that numerous other fruits and fruit products besides bananas and oranges are being gradually increased in export value from year to year. The following figures afford interesting indications of this increase: cocoa-nuts, £37,774; grape-fruit, £5,832; shaddocks, £118; Tangerine oranges, £120; limes and lime juice, £5,585; pine-apples, £524; kola-nuts, £291; whilst, tamarinds and unenumerated fruits account for £212. The total value of the fruit exported from Jamaica at the present time amounts to £537,601. The fruit exported from Jamaica as the Tangerine orange is for the most part the large fruited Mandarin orange, native of China. Both the leaves and the loose rind of this fruit possess a characteristic odour unlike that of any other of the orange tribe. The true Tangerine orange is smaller than the Mandarin, with an agreeable but slightly perfumed flavour.